Within the walls of the Museum Prof. J. D. Whitney has accommodation for geological work. He is engaged in the completion of the memoirs of his great Californian survey. He has recently issued the first part of an exhaustive monograph of the auriferous gravels of California, which is published in the *Memoirs of the Museum of Comparative Zoology*. One of the most generally interesting and important features in this essay is the cautious and masterly way in which the author states the evidence for the existence of human remains in the gravels beneath sheets of basalt, and at a depth of 130 feet from the surface. It is impossible to resist the cogency with which he marshals the facts and maintains the genuineness and high antiquity of the Calaveras skull. The second portion of the memoir, devoted to a discussion of the origin of the auriferous gravels and of the glacial phenomena of the Pacific coast and of North America generally, is awaited with much interest. Prof. Whitney, in the course of his prolonged researches in the west, made a large and important collection of rocks. These are now being carefully investigated by his associate, Dr. M. E. Wadsworth—a young petrographer, who in recently taking the degree of Doctor of Philosophy at Harvard, presented, as his thesis, a remarkable essay on rock classification, largely based on these collections. The Professor, with the devotion to geology which has characterised his long and distinguished career, carries on this work at his own expense. The results will be published in full in the *Memoirs of the Museum of Comparative Zoology*.

There is much more than the name of Cambridge to remind one of its namesake at home. Its quiet air of studious retirement, its quaint buildings and tree-shaded walks have much of the mother-country about them. One or two features of the place, however, are characteristically American. Thus in the great library at Gore Hall, most of the work of receiving and distributing books is done by young women, and done, too, with a noiseless decorum and celerity worthy of all praise. A magnificent Memorial Hall to those graduates of Harvard who fell in the late Civil War bears witness in its crowded lists of names that culture and courage may go hand in hand. The simple eloquence of these lists, where every class and division of the faculties is represented, brings home to the mind in a startling way the terrible realities of a war. May the occasion never arise for another range of tablets either there or here!

While Harvard is necessarily the great centre of scientific research, much admirable work is done in Boston in the way of practically expounding science. The Institute of Technology has for its primary object the education of the community in these branches of scientific knowledge conducive to progress in the arts and industries of life. In pursuance of this aim the methods of tuition are so practical and thorough that the results must be felt far beyond the industrial circles. Established mainly through the enlightened zeal of the present venerable President of the National Academy, Prof. W. B. Rogers, it began a few years ago to languish, but its founder has recently come back to its rescue, throwing himself into its affairs with all his old heartiness and kindliness until, freshened and stimulated by his influence, it is once more shooting up into lusty vigour. But besides this establishment, wholly devoted to scientific instruction, the Boston School Board has made the practical teaching of science an important part of education in the public schools. At an early age the pupils are led to take an interest in physiology by references to the experience of their own bodies, and thus the laws of health are firmly lodged in their minds. From simple beginnings they are conducted through successive years of progress and are well grounded in physics, chemistry, botany, and zoology, until before they leave, if they choose to go so far, they are found at work in laboratories repeating experiments, making analyses, or dissecting plants or animals. The thoroughness of the whole system, and the length to which such State-paid education goes (for it must be remembered that all this training is free), would make most members of our School Boards stand aghast, were any utopian to propose its introduction in this country.

A student of science from this side of the Atlantic besides finding himself at home among lovers of science in New England is astonished and gratified to find that if he has himself done anything to advance our knowledge of nature, his work is as well known there as at home. The welcome he receives is all the heartier from men who have long known him by name and have come already to regard him as in some measure a personal friend and fellow-worker. A brotherhood of this kind, so cosmopolitan, so genuine, and so kindly, carries with it an enduring helpfulness. One comes away from a participation in it strengthened and cheered, with wide enlargement of ideas and sympathies that seem to fill the mind with aspirations and to brace the whole frame for endless exertions to achieve them. Undoubtedly, in spite of all that demagogues may declaim, there is in American society of the more cultured kind a deep undercurrent of affection for the old country. It shows itself in many ways and sometimes crops up unconsciously and almost to the confusion of the native-born American as if he would rather be thought indifferent in the matter. The writer is tempted to conclude with an illustrative story told him by a Harvard friend to whom the incident occurred. Some years ago, just at the time that the famous pamphlet, "The Battle of Dorking," was making a stir in the States as well as here, this friend was in Kentucky with an acquaintance of his who, like so vast a number of his countrymen, had been engaged in the Civil War, and had lost heavily in friends and fortune. This man knew well what were the horrors of war, yet after he had finished reading the pamphlet, and was appealed to by his companion as to what he would do if the picture drawn in its pages were a reality instead of a fiction, he paused and after a little reflection replied, "Well, I think I'd have to go for the old country." There are many thousands of Americans who would have no objections to thrash England themselves, but who would not sit quietly and see the castigation bestowed by any other people.

A. G.

PLANTE'S "RESEARCHES IN ELECTRICITY"

Recherches sur l'Électricité. Par Gaston Planté. (Paris, 1879.)

M. GASTON PLANTÉ has published, under the above title, the elegant and important electrical researches which he has pursued with so much success

during twenty years, and with many of which the readers of NATURE have been made familiar from time to time.

The basis of these experimental researches is the *secondary battery*, originally devised by Ritter, but which in M. Planté's hands has become developed into what is practically a new and important source of electricity. M. Planté, by employing for his secondary cells large plates of lead immersed in dilute sulphuric acid, charged by a small Bunsen's or Grove's battery, and by arranging the secondary cells in such a manner that they can be charged in multiple arc, and discharged in series, obtains during the ten minutes or so during which the discharge continues currents not only of as great electromotive force as would be obtained from a Grove's battery of a much larger number of cells, but also of much greater "quantity;" the internal resistance of these secondary cells being excessively small.

In studying the construction and operation of these secondary batteries, M. Planté has brought to light a large number of interesting facts. He finds that such batteries improve with use, the two lead electrodes gradually becoming spongy, thereby holding in loose combination larger quantities of the oxygen and hydrogen gases, respectively, than new plates of lead. He observes several highly suggestive analogies between this electro-chemical accumulation of the energy of the current, and the electrostatic accumulation of the Leyden jar. This analogy extends even to the existence of a residual charge. It appears that the electromotive force of such a cell well charged may be as high as 2·7187 volts, while the internal resistance may be as low as 0·05 ohm, and that the actual quantity of the primary current which may be realised after being thus accumulated amounts to 88 per cent. These data are given amongst the stores of information in the first section of M. Planté's work. The second section treats of the practical uses which have been made by M. Trouvé and others of the currents from secondary batteries, and which embrace a wide range of applications, chief amongst which is the application to surgical cautery by means of wires raised to a white heat, for which operation a powerful current of short duration only is required. Another suggestion, to employ such batteries as accumulators of the current supplying electric lights, has already been seized upon by more than one inventor, amongst others by Mr. Edison.

The third section of the work before us deals with sundry phenomena produced by the discharge of the powerful currents of large secondary batteries. To obtain these effects M. Planté has used batteries of from 200 to 800 secondary elements. Luminous liquid globules and delicate flame-like aureoles are produced at the surface of liquids when the current is led into them under certain conditions: even a globule of fused mica has been produced by the current, and wandered about in a manner suggestive of the alleged behaviour of the "balls of fire" sometimes accompanying violent thunderstorms. The discharge may even be employed to write upon glass which is etched away under the negative pole of the secondary battery. The many analogies presented by these experiments with some of the less understood of natural phenomena, globular lightning, auroræ, and wreathed lightning discharges, &c., are treated in detail in the fourth section. M. Planté considers the "Fire of Saint Elmo" to be a phenomenon of discharge of negative electricity, whilst he compares the globular lightning to the phenomena observed in the discharges at the positive pole of his batteries. One of the most curious of his speculations is that concerning the spiral nebulæ, which he compares with the spiral forms produced at the negative pole when dilute acid is electrolysed by a moderately strong current between copper electrodes in the presence of a powerful electromagnet. These "electrodynamic" spirals consist of streams of particles of oxide of copper whirled off from the end of the electrode and which, conducting the current, undergo a rotatory displacement under the influence of the neighbouring magnet. These spirals, which therefore indicate the lines of flow of the current, resemble the spirals obtained by the present writer in iron filings under the joint influence of a magnet and a current traversing it longitudinally, and which differed from those of M. Planté in indicating lines of magnetic induction, not lines of current flow. So strongly does the analogy of form weigh with M. Planté that he asks (p. 243) whether the nucleus of a spiral nebula is not truly an "electric focus," and "whether the spiral form is not probably determined by the presence in the neighbourhood of strongly magnetised heavenly bodies!" Another astronomical analogy is discovered by the author between the sun-spots and certain "crateriform perforations" which are produced in moistened paper beneath the positive pole of the secondary battery.

The fifth, and last part of the work, explains the construction and operation of the author's "rheostatic machine," which is a series of mica condensers which are charged in multiple arc from a battery of 600 or 800 secondary elements, and discharged in series in very rapid succession. This instrument is capable of producing almost continuously the effects of intense discharges of statical electricity, and promises to prove of great utility as an instrument of research.

We have preferred to give the reader a brief *résumé* of the contents of this delightful narrative of researches, rather than to criticise in detail the many salient points which it presents. Experimental researches of the present day are seldom conducted with such patient and ingenious endeavour as those now published in M. Planté's volume. The student of electrical theory will find in them but little that he did not know before. The phenomenal not the theoretical aspect of the question is ever uppermost; and in default of theory there is a tendency to ride *the analogies* too hard. But none can help admiring the beauty and originality of the experiments here recorded, nor doubt the very high value of the results obtained. There will, too, be many readers who will long that all treatises on experimental science were written in so clear, concise, and elegant a style as that of the author.

SILVANUS P. THOMPSON

NATURAL HISTORY OF THE ANCIENTS

Gleanings from the Natural History of the Ancients. By the Rev. W. Houghton, M.A., F.L.S. Illustrated. (London: Cassell, Petter, and Galpin, 1880.)

THIS interesting volume consists of a series of short lectures treating of most of the animals known to the early inhabitants of Egypt, Palestine, Assyria, Greece,